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Mapping Indian Contribution in Rice Beer Research: A Bibliometric Assessment

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Abstract

Alcoholic drinks have been prepared and consumed in India from ancient times. Many techniques are applied to brew alcohol locally, out of which rice beer is very prominent. Scientific research has been conducted to standardize the brewing technique of local tribes for mass production and storage. This study aims to explore India's publication pattern in rice beer research during 1990-2019. This study analyzes a total of 84 papers on rice beer obtained from the Web of Science database. The distribution of literature on rice beer has been analyzed year-wise, document wise, favoured research areas frequently occurred keywords. Data were extracted through the Web of Science database related to August 2020. Results revealed that: i) 2014 is the most productive year; ii) articles found to be the principal source of publications iii) the most preferred research area on rice beer is Food Science Technology; iv) the occurrence of keywords found with the help VOSviewer. This current study is a bibliometric analysis of rice beer which has been carried out to find the research trend at the national level.

Keywords: Bibliometric Analysis, Research Output, Rice Beer, Alcoholic Beverages, Desi Daru

1. INTRODUCTION

Fermentation is one of the oldest techniques to preserve and produce foods and beverages. Fermented foods also have some health-related benefits to people as it has probiotics, antimicrobial, antioxidant properties, etc. In a fermentation process, microorganisms play a pivotal role as it improves the nutritional quality of food, enhances flavour and preserves food for a longer time. Rice beer is a beverage obtained through fermentation, and it has nutritional, cultural, and medicinal value. Many communities in India produce rice-based fermented beverages traditionally, consumed it regularly, and cultural or religious occasions and also serve to guests as a mark of respect. The herbal plants used in the preparation of beverages has therapeutic properties. In India, the traditional rice-based fermented beverage is prepared in different states with different names such as Atingba (Manipur), Jaanr (Sikkim), Apong; Jumin (Arunachal Pradesh), Saimod, Judima, Xaaj, and Joubishi (Assam), Kaid (Meghalaya), Handia (Jharkhand, Odisha and West Bengal) and many more. Research on rice beer has gained the

attention of food researchers as it is a fermented product. Gradually research on rice beer is increasing to investigate the preparation process of rice beer, health-related benefits or issues, etc. The present study is based on a bibliometric analysis of rice beer research in India for the years 1995-2019. Bibliometrics has become an essential tool to assess the research performance of a particular institution or a country in a specific area of investigation. Bibliometrics help to identify a new area of research and also help a funding agency to identify individual institutions working on a particular topic and allocate funds. Here, an effort has been made to investigate the research output on rice beer at a national perspective.

2. LITERATURE REVIEW

Review of related literature enables the researcher to comprehend the research gaps, methods adopted to conduct a study. Various bibliometric studies have been carried to measure research conducted in a specific area are reviewed here. Kolle and Thyavanahalli researched to find out the global contribution on air pollution by collecting data from Web of Science published between 1995-2019. The study revealed that 4,424 articles were published; the majority of the papers were published under the Environmental Science subject category. Keyword analysis was also done using the VOSViewer software, and cluster analysis was also constructed.

Another study based on a bibliometric analysis of Stem cell was conducted by Ahmadi et al. to find out the qualitative and quantitative level of stem cell research in Iran. The results revealed that until 2012, 709 papers were published. Up to 2004, only six articles were published, but from 2004 onwards there was a gradual development in the publications.

Krishnamoorthy, Ramakrishnan, and Devi mapped the literature published on Diabetes during 1995-2004. Data were collected from the MEDLINE database. Relative growth rate and Doubling time were also calculated, and the results show that RGR has shown a decreasing trend, whereas doubling time was increasing. Bradford's law confirms its implication on this study.

Garg et al. have made a scientometric study on plant genetics and breeding of papers produced by the UK, USA, China, Brazil, and with particular reference to India. After analyzing 32,574 documents, it is showed that the USA tops in terms of publications. Results also indicated that 3042 articles were contributed by 1806 Indian institutions and IARI topped among all with 167 papers. Bartol & Talarczyk have examined the publishing pattern on fiber crops indexed in Google Scholar, Scopus, and Web of Science. In Scopus, China secured 1st in terms of publications followed by the USA and in WoS, USA stood 1st.

In another study, Senthilkumaran & Amudhavalli mapped spices research in the global perspective, contribution by Asian countries as well as the productivity pattern of India. It is revealed that in India, maximum research is engaged in mustard, chilli, and peppers. Majority of spices literature published in the form of journal articles.

Scientometric study on cereal crops research in India indexed in Indian Science Abstracts, and CAB Abstracts undertook by Tripathi, Sharma & Garg to find out the most productive institutions, journals preferred, authorship pattern, most prolific authors. State Agricultural Universities and IARI were found to be the most productive institutions.

3. OBJECTIVES OF THE STUDY

(i) To quantify the growth of literature on rice beer at the national level;

(ii) To analyze the document wise distribution of publications;

(iii) To identify the most preferred research area;

(iv) To find the occurrence of keywords using VOSviewer.

4. METHODOLOGY

For this study, data was collected from the Web of Science database for a period of 25 years (1995 to 2019), contributed by Indian researchers. The database was searched with some keywords, and the keywords were taken from National Agricultural Library Thesaurus. Some of the local names of rice beer were collected after studying papers related to rice beer. Following retrieval operations was performed to collect data TS= (rice beer OR rice wine OR alcoholic beverage* OR fermented beverage* OR marcha* OR apong OR judima OR handia OR jaanr) AND CU=(India) Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=All years, Total=391 were retrieved (1990-2020). After downloading data, irrelevant data were deleted, and 84 papers published between 1995-2019 were found related and retrieved with the help of MS –Excel and data were analyzed. Keywords analysis was done with the help of VOSviewer.

5. RESULTS AND DISCUSSION

5.1 Year of Publication

Table 1 summarizes the year-wise distribution of research output on rice beer contributed by Indian authors, which shows a total of 84 papers were produced during 1995-2019. It is observed that 2014 is the most productive year with the highest number of 12(14.29%) publications. Out of the total 1261 citations, the highest number of citations were obtained in 2016, i.e. 208.

Table 1: Year-wise Publications and Citations

Publication Year	Records	Percentage (%)	Total Citations
2019	5	5.95	6
2018	9	10.71	44
2017	6	7.14	19
2016	8	9.52	208
2015	9	10.71	143
2014	12	14.29	152
2013	2	2.38	4
2012	9	10.71	146
2011	2	2.38	12
2010	3	3.57	26
2009	1	1.19	41
2008	1	1.19	68
2007	7	8.33	69
2006	4	4.76	203
2005	2	2.38	78
2003	1	1.19	2
1998	1	1.19	0
1996	1	1.19	11
1995	1	1.19	29
Total	**84**	**100**	**1261**

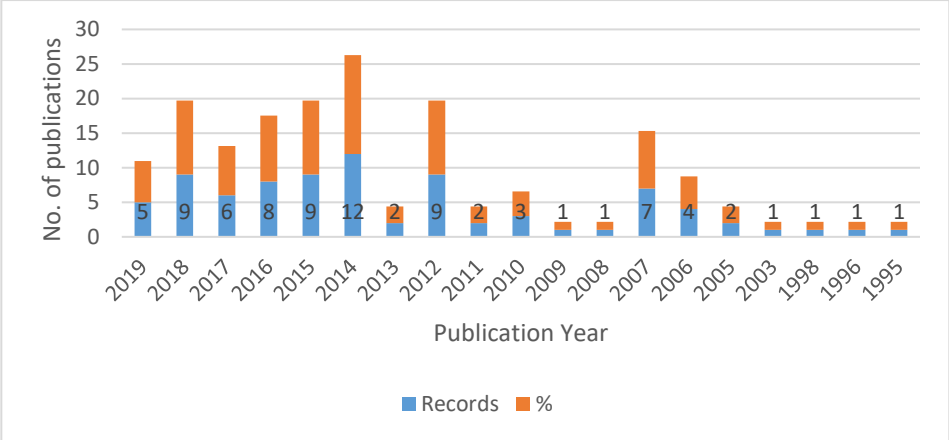

Figure 1: Year-wise growth of publication

5.2 Publication Types:

The document type on rice beer which was published during 1995-2019 listed in table 2. Out of 84 publications, 75(89.29%) are article, 7(8.33%) are reviews, editorial material, and proceedings paper is 1(1.19%) each. The highest ACPP is for review, i.e. 44.29, followed by proceedings

article for which the ACPP is 29, 44.29 ACPP received by review paper, and editorial material received is 1.19.

Table 2: Publication wise distribution of rice beer literature

Publication Type	TP	%	Total Citation	ACPP
Article	75	89.29	921	12.28
Review	7	8.33	310	44.29
Editorial Material	1	1.19	1	1
Proceedings Paper	1	1.19	29	29
Total	**84**	**100**	**1261**	**15.01**

***** *TP= Total Publications*
** ACPP= Average Citations Per Paper*

5.3 Degree of Collaboration

To determine the level of collaboration of authors, the formula proposed by Subramanyam to calculate the degree of research collaboration was used. It is evident from Table 3 that during the period of the study, the degree of collaboration "C" is calculated as 0.98. The degree of collaboration ranges from 0.95 to 1.

$$\mathbf{C = \frac{N_M}{N_M + N_s}}$$

Where, **C= Degree of Collaboration**
N_M = No. of multiple-authored papers
N_S= No. of single-authored paper

Table 3: Degree of Collaboration

Year	Single Authored	Multi-Authored	Total	Degree of Collaboration
1995-1999	0	3	3	1
2000-2004	0	1	1	1
2005-2009	0	15	15	1
2010-2014	0	28	28	1
2015-2019	2	35	37	0.95
Total	**2**	**82**	**84**	**0.98**

5.4 Top ten Area of Research

Table 4: Area- wise distribution of research output

Sl. No.	Research Areas	Records	%
1	Food Science Technology	26	30.95
2	Plant Sciences	23	27.38
3	Microbiology	18	21.43
4	Biotechnology Applied Microbiology	13	15.48
5	Agriculture	5	5.95
6	Chemistry	4	4.76
7	Nutrition Dietetics	4	4.76
8	Science Technology Other Topics	4	4.76
9	Biochemistry Molecular Biology	3	3.57
10	Pharmacology Pharmacy	2	2.38

Table 4 lists 20 specific areas of research according to Web of Science, out of which the top 10 thrust areas have been recorded. The highest occurrence of 84 (30.95%) publications published most significant interest of research among the Indian contributors is in the area of Food Science Technology followed by 23 (27.38%) publications is in Plant Sciences, Microbiology 18 (21.43%) and followed by other research areas.

5.5 Highly cited paper on rice beer

Table 5. Top ten highly cited article on rice beer

Sl. No.	Title	Authors	Journal Title	Year	Total Citations
1	Phenotypic and Genotypic Identification of Bacteria Isolated From Traditionally Prepared Dry Starters of the Eastern Himalayas	Pradhan, P; Tamang, JP	Frontiers in Microbiology	2016	139
2	Bioflavonoids from Artocarpus heterophyllus lam. and Cyclosorus extensus (blume) H. Ito as preservatives for increased storage stability of rice beer	Das, AJ; Miyaji, T; Deka, SC	Fems Yeast Research	2006	93
3	An overview of traditional rice beer of North-east India: ethnic	Nath, N; Ghosh, S; Rahaman, L;	International Journal of Food Microbiology	2008	68

	preparation, challenges and prospects	Kaipeng, DL; Sharma, BK			
4	Exploring the microbiota and metabolites of traditional rice beer varieties of Assam and their functionalities	Das, S; Deb, D; Adak, A; Khan, MR	National Medical Journal of India	2006	60
5	Mycobiome Diversity in Traditionally Prepared Starters for Alcoholic Beverages in India by High-Throughput Sequencing Method	Sha, SP; Suryavanshi, MV; Tamang, JP	Lwt-Food Science and Technology	2015	59
6	Prospects of Indian traditional fermented food as functional foods	Chaudhary, A; Sharma, DK; Arora, A	International Journal of Food Microbiology	2005	58
7	Diversity of Yeasts and Molds by Culture-Dependent and Culture-Independent Methods for Mycobiome Surveillance of Traditionally Prepared Dried Starters for the Production of Indian Alcoholic Beverages	Sha, SP; Suryavanshi, MV; Jani, K; Sharma, A; Shouche, Y; Tamang, JP	Journal of Food Science and Technology-Mysore	2012	46
8	Use of a Potential Probiotic, Lactobacillus plantarum L7, for the Preparation of a Rice-Based Fermented Beverage	Giri, SS; Sen, SS; Saha, S; Sukumaran, V; Park, SC	Indian Journal of Traditional Knowledge	2009	41
9	'Jumin' a traditional beverage of Nocte tribe in Arunachal Pradesh: an ethnobotanical survey	Bhatt, KC; Malav, PK; Ahlawat, SP	Indian Journal of Traditional Knowledge	2012	41
10	Bifidobacteria and its rice fermented products on diet induced obese mice: analysis of physical status, serum profile and gene expressions	Ray, M; Hor, PK; Ojha, D; Soren, JP; Singh, SN; Mondal, KC	International Journal of Biological Macromolecules	2014	33

The top ten papers are listed in Table 4, according to citations received. It is found the top most cited articles were published between 2005 and 2016. A total of 638 citations were received by the top ten highly cited papers with an average of 64 citations per paper. The review paper "Phenotypic and Genotypic Identification of Bacteria Isolated from Traditionally Prepared Dry Starters of the Eastern Himalayas" received the highest number of citations (139) which was published in 2016 in Frontiers in Microbiology. It is also found that out of 10 papers, 7 are journal articles, followed by 3 review papers.

5.6 Keyword analysis of rice beer research

The occurrence of keywords was constructed using VOSviewer software. VOSviewer is a computer program that uses VOS mapping technique, where VOS stands for visualization of similarities. This software helps to construct and display a bibliometrics map of authors, journals, keywords based on citation, and co-occurrence data. VOSviewer is a software that helps to establish a relation between keywords, citation, and also collaborative relation between authors, organizations, countries and presents information in the form of a map. It supports data from 4 different databases such as Web of Science, Scopus, Pubmed, and Dimensions. Figure 2 presents the top ten keywords that appeared in the papers were considered for network visualization map. The topmost frequently appeared keywords appeared in rice beer research between 1995-2019 were arranged in descending order: lactic-acid bacteria (16), identification (14), fermentation (12), marcha (10), fermented foods (9), rice beer (9), strains (9), antioxidant activity (8), foods (8), probiotics (8).

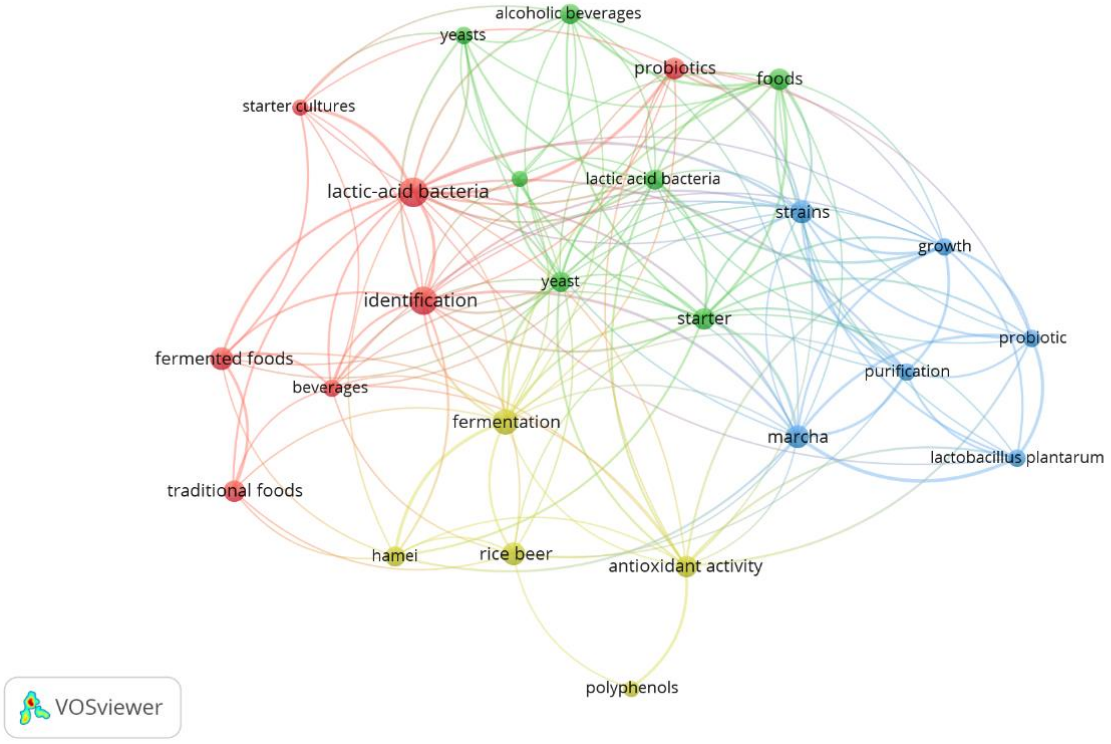

Figure 2: Keywords occurred in rice beer papers

6. Findings and Conclusion

In India, almost all ethnic tribes prepare and consume rice beer that provides essential proteins, vitamins, amino acids, and nutrients that boost the immune system and also help to prevent from

various diseases. Scientific research on rice beer might disclose some other important properties that might prove to be beneficial for humankind. It is witnessed that fermented products are gradually gaining popularity as it has numerous health-related benefits, and a lot of research is going on. This study attempted to examine the growth of publication, document wise publication, the most popular area of research on rice beer in India. It is observed that the publication pattern on rice is erratic. This paper has inspected 84 records which were indexed and cited in the WoS Database from 1995– 2019. Over the past 25 years, publications related to rice beer has increased gradually. Some of the key findings suggest that the maximum number of papers were published in 2014, journal articles were the predominant source of publications, multiple-authorship paper dominates as compared to single-author paper. The top ten preferred Areas of Research were listed, Food Science Technology secured the first rank. It is found that the degree of collaboration during the overall 25 years is 0.98. The study is limited to quantitative analysis of rice beer publication in India only, and similar studies can be carried at a global level. Another limitation is that the publication data collected for the present study were confined to the data that appeared in the Web of Science database. It is also recommended that other databases can be used to collect data on rice beer to make a comprehensive study. As the current study deals with publication patterns on rice beer research, it is recommended that similar studies on the particular topic may be carried out at regional, national, and global levels.

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